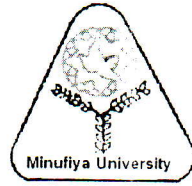


Menoufiya University
Faculty of Engineering
Shebin El-Kom
Second Semester Examination
Academic Year: 2013-2014
Date: 23 /1 /2014



Department: Electrical Engineering
Post Graduate Course, Diploma
Time allowed: 3 Hours
Course Title/Code: Management and Operation
of Electrical Power Systems / ELE 511

Allowed Tables and Charts: None

Answer the following questions:

[100Mark]

Question (1)

[40Mark]

- (a) Explain the economic power dispatch problem. (10Mark)
- (b) Using least square method, compute the cost coefficients of fuel cost function represented by (10Mark)

$$F_i(P_i) = a_i P_i^2 + b_i P_i + c_i$$

- (c) The incremental costs for a plant consisting of three units are:

(20Mark)

$$df_1/dp_1 = 0.03 P_1 + 6 \quad \$/MWh$$

$$df_2/dp_2 = 0.09 P_2 + 3 \quad \$/MWh$$

$$df_3/dp_3 = 0.02 P_3 + 4 \quad \$/MWh$$

Assume the total load varies from 150 to 450 MW with step 50 MW and the power output limits are $25 \leq P_1 \leq 150$ MW and $50 \leq P_2 \leq 100$ MW. Find the incremental fuel cost of the plant and the allocation of load between units for the minimum cost of operation.

Question (2)

[30Mark]

- (a) Neglecting transmission losses, drive the condition for optimal operation of electrical power system. (10Mark)

- (b) A power system has two thermal generating units with parameters:

(20Mark)

$$a_1 = 4.036 * 10^{-3}$$

$$a_2 = 4.812 * 10^{-3}$$

$$b_1 = 5.93$$

$$b_2 = 6.02$$

Given that this system has the following B -coefficients,

$$B_{11} = 3.95 * 10^{-4}$$

$$B_{22} = 4.63 * 10^{-4}$$

and the total generated power from the two units is 700 MW, Calculate:

1. The incremental fuel cost

2. Efficiency of the system

Question (3)

[30Mark]

(a) Explain:

The constraints of unit commitment problem - The difference between economic power dispatch problem and unit commitment problem. **(10Mark)**

(b) A power system has 3 thermal generating units with parameters listed in the table below. Determine the most economical units to be committed for a load of 4 MW. Let the load change be in step of 1 MW. The cost function equation is: $F_i(x) = a_i P_i^2 + b_i P_i + c_i$ and the power of each unit varies from 1.0 MW to 5.0 MW. Use Dynamic programming method. **(20Mark)**

Units	Cost curve coefficients		
	a_i	b_i	c_i
1	0.77	47.0	50
2	1.60	53.0	50
3	2.60	60.0	50

Good Luck, Dr. Shaimaa Rabah

ملحوظة: هذا الجدول خاص بالجوده ولا يعنى الطالب

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	a1-1, a13-1, a23-1	b1-1, b7-1, b13-1, b16-1, b16-2	C7-1, c17-1	
Question No.	1, 2,3,4	1, 2,3,4	1, 2,3,4	